

there also do the "resolvables." This was stated, in the first instance, in a letter to Mr. R. A. Proctor, in conference with whom much of Mr. Waters's early astronomical work was undertaken. At the next meeting of the Society Mr. Waters (not yet quite of age) was elected a Fellow, and in the "Supplementary number" for 1873, he published the isographic charts of nebulae and clusters on which he based the above conclusion. Recently (1894 June) he revised these charts by the help of Dr. Dreyer's New General Catalogue. He also, in 1878, gave an isographic chart of the stars in the southern hemisphere. These papers represent practically the whole of his published work, but his devotion to astronomy was shown in many ways. He went to Norway in August of the past year to observe the Total Solar Eclipse, having equipped himself with a special telescope camera. He made a very fine private collection of astrolabes; and he took a prominent part in the private business of this Society. He married in 1877 a daughter of the Rev. Edward White, and leaves a son and two daughters. Mr. Waters was grandson of the Rev. Thomas Waters and of Mr. E. Leader Williams, both of Worcester, and nephew of Mr. B. W. Leader, A.R.A., and of Sir E. Leader Williams, engineer of the Ship Canal. He died on 1896 December 14, at his residence, 44, Ladbroke Grove, W.

BENJAMIN APTHORP GOULD was born in Boston, 1824 September 27. He entered the Boston Latin School in 1836, and graduated from Harvard College, with high distinction in classical, as well as in mathematical and physical studies, in 1844. After teaching for a year in the Latin School, he decided to devote himself to a purely scientific career. As a preparation for this he went to Europe in 1845 July, to study astronomy, working at the Greenwich Observatory three months, at the Paris Observatory four months, at the Berlin Observatory a year, at Göttingen Observatory one year, at Altona Observatory four months, and at Gotha Observatory one month. He returned home in 1848. In 1852 he was appointed to take charge of the longitude determinations of the Coast Survey. He organised, developed and extended this service, retiring in 1867. Meanwhile, in 1855, he became Director of the Dudley Observatory, in Albany, equipped and organised the institution, and carried it on without remuneration and at his private expense. He left it in 1859, after a severe struggle to preserve the institution for purposes of scientific investigation.

In 1859 he published his discussion of the places and proper motions of circumpolar stars for use as standards in the Coast Survey. These, as revised by him in 1861, together with his similar list of clock-stars, were adopted as the standards for the American ephemeris, and, as to the circumpolars, remain in such use to this day. In 1866 he published his reduction of d'Agelet's observations. About the same time he performed a similar service for the greater part of the observations made at the

United States Naval Observatory since its establishment, and also for the expedition to Chili to determine the solar parallax. In 1866 he planned and executed the work of establishing, by the Atlantic cable, the relation in longitude between European and American stations. As actuary of the United States Sanitary Commission he conducted, and published in a large volume, extensive and important researches upon Military and Anthropological Statistics and the Distribution of Population. About the same time he undertook the reduction of Rutherford's photographs of the *Pleiades*. The results, partially published in 1866, were submitted completely, in an elaborate memoir, to the National Academy in 1870, together with a second memoir on the *Prosepe*. He was, indeed, a pioneer in the utilisation of photography for exact astronomical measurement. About 1864 he built an observatory in Cambridge, equipped with an 8-foot transit-instrument, and, until 1867, carried on a determination of the right ascensions of all the stars to the tenth magnitude within one degree of the pole. This work was completely reduced, but the discussion and publication were postponed by his removal to Cordoba.

In 1865 he became intensely impressed with a desire to explore the southern celestial hemisphere. The opportunity to do so soon came. This project assumed at first the form of a private astronomical expedition, for which his friends in Boston had promised the pecuniary means; but, under the enthusiastic support of Mr. Sarmiento, at first as Argentine Minister to this country, and later as President of that Republic, it rapidly broadened, and finally led to the establishment by Dr. Gould of a permanent National Observatory at Cordoba. This important addition to the observatories of the Southern hemisphere, which are comparatively so few, forms an impressive monument to his memory.

It is impossible, in brief space, to describe or characterise the marvellous work here undertaken and so faultlessly pushed to completion by Dr. Gould, during the fifteen years of self-imposed exile from his native land, with unfaltering devotion and energy, in the face of difficulty and domestic bereavement. The work on the uranography of the southern heavens was finished in 1874, and was published under the title of the *Uranometria Argentina*, which will remain a classic for all time. For this work he received the Gold Medal of this Society in 1883, and in presenting it, the President remarked that, great and important as the work was, it was still but a small, and in his opinion, not the most valuable part of that which Dr. Gould had done at Cordoba. The zone observations of the stars between  $23^{\circ}$  and  $80^{\circ}$  south declination, which were the original and always the dominant object of the enterprise, were begun in 1872, substantially completed in 1877, and revised in 1882-83. This work was embodied in the Zone Catalogues containing 73,160 stars, which appeared in 1884. Parallel with this, and almost overshadowing it in importance, was

carried on the independent series of meridian-circle observations for the General Catalogue of 32,448 stars, completed in 1885. Dr. Gould, besides, left the manuscript of the remainder of his series of fifteen volumes, not then published—containing the observations and the annual catalogues, incorporated in the General Catalogue—complete to the minutest detail ready for the printer. These have since appeared from time to time—the last volume, rounding off his work, reaching Cambridge but a few hours before his death.

Another part of the work for the Cordoba Observatory, planned by Dr. Gould as a fitting extension of it, was a *Durchmusterung* of the southern sky. For this, indeed, he had provided the instrumental means and trained the assistants, it being his purpose to be ready to begin it at any time in case of unforeseen delay or accident to the other work. On leaving Cordoba he confided it to the care of Dr. Thome and Mr. Tucker, who have since so worthily conducted it.

Dr. Gould also established, under the auspices of the Argentine Government, a meteorological service, second in extent, it is believed, only to that of the United States. Upon leaving South America he intrusted this charge to the hands of his worthy successor, Walter G. Davis.

The earliest to realise and demonstrate the capabilities of photography to render service to the astronomy of precision, Dr. Gould, by his experience with the Rutherford plates of the *Pleiades* and the *Præsepe*, was incited to arrange to carry forward at Cordoba, on an extensive scale, a similar work upon the southern stellar clusters. His other labours there were so onerous that he confined his attention to securing plates suitable for precise measurement. Of these he accumulated about 1,400, and brought them home with him in 1885 for measurement and reduction. Without permitting himself a well-earned retirement, he turned at once tirelessly to this labour, which has been the principal occupation of the last ten years of his life. This is substantially complete, so that it will be given to the world as it came from his hand. That he might be spared to do this was his most earnest solicitude and hope.

Dr. Gould had, as we have already remarked, an enthusiasm for his beloved science far wider than the limits of what he could accomplish by personal investigation. Early in his career he had realised that astronomy had reached a stage of development in America which entitled it to a higher claim than had yet been accorded to it, and that a journal worthily supporting the dignity of a pure science would have very great influence upon its future progress. Accordingly, without ostentation, he established the *Astronomical Journal* in 1849, offering it to the use of astronomers, for the publication exclusively of original investigations. He edited and supported it until, at the end of the sixth volume in 1861, its issue was suspended, first by the war for the preservation of the Union, afterward by his absence in

Cordoba. A long-nurtured hope was realised when he was enabled in 1885 to resume its publication, and to continue it at the rate of nearly one volume annually to the present time. With careful forethought he has made due provision for its continuance.

Considered apart from the great things he accomplished, the first point that strikes us in Dr. Gould's career is the intimate way in which it is bound up with the history of his beloved science on both sides of the Atlantic, and the unique position he held, as illustrated by the number and extent of his personal alliances. It is scarcely possible to realise that he was the friend of Von Humboldt, then in his seventy-seventh year; that it was due to the friendly interest of this great man indeed that he became the pupil, friend, and intimate in the household of the great master of modern astronomy, Gauss, then in his seventieth year; that he was a pupil of the illustrious Encke, of the elder Struve, of Hansen, of Peters and Argelander, and the life-long friend of these and other revered men, the pillars of the science. His correspondence with them after he returned to his native land testifies to the mutual confidence that characterised these memorable associations. Following these in the next generation come Winnecke, Schönfeld, Auwers, and a numerous host besides, which to us are great names, but to Gould were fellow-pupils and associates. Of the same epoch, in America, we have Bache, Peirce, Walker, Hubbard, Coffin, Chauvenet, and Winlock. Then come the two living generations of astronomers, bringing friendships and acquaintances wide as the world itself, extending his relations to the youngest workers in the science. With such universal and intimate connection with the personal forces operating to advance astronomy in all lands, with his intense patriotism, with his strong intellectual and moral traits, he could not fail to exercise a powerful moulding influence upon the development of American astronomy. It was to this end, in preference to the satisfaction of ambition through what he could achieve by his personal contributions to the fund of knowledge, that his most earnest efforts from the beginning of his career were directed. In one of his letters to Von Humboldt, in 1850, after speaking of the dependent condition at that time of science in America, its self-distrust and intellectual timidity, he says: "This I knew before returning home, but realise it now, for the first time, to its full extent. Therefore it is that I dedicate my whole efforts, not to the attainment of any reputation for myself, but to serving to the utmost of my ability the science of my country—or, rather, as my friend Mr. Agassiz tells me I must say, science in my country." And to Encke he says, speaking of the establishment of the *Astronomical Journal*, and his fond hopes in its agency as a means of raising the astronomy of America to its proper position: "Though the labour of supporting it will prevent me from working as I otherwise should for the advancement of my own reputation, still the consciousness that I may render now



a still greater service to science reconciles me to the abandonment of a good deal of personal ambition." The same spirit breathes throughout his correspondence with Gauss, Schumacher, and other great leaders abroad, to whom he was wont to confide his projects and aspirations, and who sympathised with and counselled him in return. His letter-books are rich with similar illustrations.

And this brings us to another remarkable point about Dr. Gould's career. If we were asked to place the finger upon the epoch marking the birth, or regeneration, of American astronomy, we should feel inclined to name the date 1845 July, when Gould placed his foot upon the steamer from Boston with the avowed and definite purpose to devote himself to a life purely of scientific research. Up to that time the instance of a man doing this as his only earthly aim, while unassured of a professor's chair or similar appointment, and not as a means of livelihood, was in America absolutely unknown.

He inspired a new breath into American astronomy. The new atmosphere which he brought with him from Germany, where he caught the spirit of the great masters under whom he studied, became gradually transfused through the States. His enthusiasm for the introduction of better means and methods of research was caught by his compatriots, their courage in the effort to regenerate our science was sustained, and transmitted through various channels to the next and to the present generation.

Dr. Gould married, in 1861, Mary Apthorp Quincy, daughter of Hon. Josiah Quincy. She died in 1883. Her sympathy with and influence upon his life work may be most reverently spoken of by recalling the affecting lines of his dedication of the great Zone Catalogues: "This Catalogue of Southern Stars, the fruit of nearly thirteen years of assiduous toil, is dedicated to the beloved and honoured memory of Mary Apthorp Quincy Gould, to whose approval and unselfish encouragement the original undertaking was due, by whose sympathy, self-sacrifice, and practical assistance its execution was made possible, who bravely endured privation, exile, and afflictive bereavement that it might be worthily finished, but who has not seen its completion."

Dr. Gould received the degree of Ph.D. from Göttingen in 1848, and that of LL.D. from Harvard in 1885, and from Columbia in 1887. He was For. Mem. Roy. Soc. (London); For. Assoc. Roy. Astr. Soc. (London); Cor. Mem. Acad. Sci. (Institut de France); Acad. Imp. Sci. (St. Petersburg); Kön. Akad. Wiss. (Berlin); Kön. Ges. Wiss. (Göttingen); Kais. Akad. Wiss. (Vienna); Bur. d. Long. (Paris). He also received the order *Pour le Mérite* from Prussia..

[For the above notice the Council is indebted to Mr. S. C. Chandler.]

HUGO GYLDÉN was born in Helsingfors, Finland, on 1841 May 29. The only son of his parents, he received from them the